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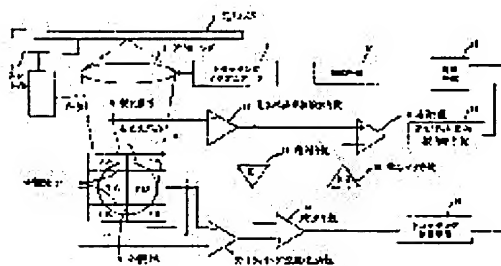
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(54) OPTICAL DISK DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To realize the detection of a tracking error signal, free of mixing of cross-groove mixed components, and the detection of an objective lens position, in an optical disk device for reproducing and recording on an optical disk.

SOLUTION: This device is provided with a tracking error detecting means 10 for tracks and optical beams, a means which divides a reflected light spot 6 from an optical disk 1 nearly vertically against a track-equivalent direction which divides the optical spot 6 into an end and a middle area against the center, and which calculates in accordance with the output of plural photodetector cells 7A-7D of the light for which the areas are further divided nearly in parallel with respect to the track equivalent direction, and is provided with an optical spot displacement detecting means 11 for relative displacement of the optical spot on a light receiving element, a means which calculates in accordance with the output of plural photodetector cells of the light in the end area. Through the calculation of the output of the tracking error detecting means 10 and that of the optical spot displacement detecting means 11, a processing including prescribed weighting is performed, on the tracking error signal corrected from a first correcting means 13, by a weighting means 18, a second correcting means, thereby obtaining an ideal lens displacement detecting signal.



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CLAIMS

[Claim(s)]

[Claim 1]An optical disk unit outputting a light spot displacement detection signal amended by performing an operation with a signal characterized by comprising the following.

An object lens which condenses an optical beam on an information surface of an optical disc in which an information signal is recorded with a predetermined track gestalt.

An optical pickup which has an object lens transportation device which moves said object lens to an abbreviated perpendicular to a direction equivalent to said track.

Light spot reflected from said optical disc is divided into an abbreviated perpendicular to a direction equivalent to said track, Said light spot is divided into an end field and a middle area to the center, and said end field and said middle area are divided almost in parallel to a direction which is further equivalent to said track, and it is a photo detector which has two or more light-receiving cells which receive light comparatively therefore divided by these. By performing an operation according to an output of two or more of said light-receiving cells which receive light of said middle area, By performing an operation according to an output of two or more of said light-receiving cells which receive said track, a tracking-error detection means to detect a relative displacement of said optical beam, and light of said end field, It has a light spot displacement detecting means which detects a relative displacement of said light spot on said photo detector, and is each output of said tracking-error detection means and said light spot displacement detecting means.

[Claim 2]An optical disk unit outputting a light spot displacement detection signal amended by performing processing characterized by comprising the following which includes a signal for predetermined weighting, and subtracting or adding.

An object lens which condenses an optical beam on an information surface of an optical disc in which an information signal is recorded with a predetermined track gestalt.

An optical pickup which has an object lens transportation device which moves said object lens to an abbreviated perpendicular to a direction equivalent to said track.

Light spot reflected from said optical disc is divided into an abbreviated perpendicular to a direction equivalent to said track, Said light spot is divided into an end field and a middle area to the center, and said end field and said middle area are divided almost in parallel to a direction which is further equivalent to said track, and it is a photo detector which has two or more light-receiving cells which receive light comparatively therefore divided by these. By performing an operation according to an output of two or more of said light-receiving cells which receive light of said middle area, By performing an operation according to an output of two or more of said light-receiving cells which receive said track, a tracking-error detection means to detect a relative displacement of said optical beam, and light of said end field, It has a light spot displacement detecting means which detects a relative displacement of said light spot on said photo detector, and is each output of said tracking-error detection means and said light spot displacement detecting means.

[Claim 3]An optical disk unit comprising:

An object lens which condenses an optical beam on an information surface of an optical disc in which an information signal is recorded with a predetermined track gestalt.

An optical pickup which has an object lens transportation device which moves said object lens to an abbreviated perpendicular to a direction equivalent to said track.

Light spot reflected from said optical disc is divided into an abbreviated perpendicular to a direction equivalent to said track, Said light spot is divided into an end field and a middle area to the center, and said end field and said middle area are divided almost in parallel to a direction which is further equivalent to said track, and it is a photo detector which has two or more light-receiving cells which receive light comparatively therefore divided by these. By performing an operation according to an output of two or more of said light-receiving cells which receive light of said middle area, By performing an operation according to an output of two or more of said light-receiving cells which receive said track, a tracking-error detection means to detect a relative displacement of said optical beam, and light of said end field, By calculating a light spot displacement detecting means which detects a relative displacement of said light spot on said photo detector, an output of said tracking-error detection means, and an output of said light spot displacement detecting means, The 2nd compensation means that outputs a light spot displacement detection signal amended by calculating an output of the 1st compensation means that outputs an amended tracking error signal, and an output of said light spot displacement detecting means, said tracking-error

detection means or said 1st compensation means.

[Claim 4]An optical disk unit having the 2nd compensation means that outputs a light spot displacement detection signal amended by performing processing characterized by comprising the following, and subtracting or adding. An object lens which condenses an optical beam on an information surface of an optical disc in which an information signal is recorded with a predetermined track gestalt.

An optical pickup which has an object lens transportation device which moves said object lens to an abbreviated perpendicular to a direction equivalent to said track.

Light spot reflected from said optical disc is divided into an abbreviated perpendicular to a direction equivalent to said track, Said light spot is divided into an end field and a middle area to the center, and said end field and said middle area are divided almost in parallel to a direction which is further equivalent to said track, and it is a photo detector which has two or more light-receiving cells which receive light comparatively therefore divided by these. By performing an operation according to an output of two or more of said light-receiving cells which receive light of said middle area, By performing an operation according to an output of two or more of said light-receiving cells which receive said track, a tracking-error detection means to detect a relative displacement of said optical beam, and light of said end field, By calculating a light spot displacement detecting means which detects a relative displacement of said light spot on said photo detector, an output of said tracking-error detection means, and an output of said light spot displacement detecting means, It is predetermined weighting about an output of the 1st compensation means that outputs an amended tracking error signal, and an output of said light spot displacement detecting means, said tracking-error detection means or said 1st compensation means.

[Claim 5]An optical disk unit having the 2nd compensation means that outputs a light spot displacement detection signal amended by performing processing characterized by comprising the following, and subtracting or adding.

An object lens which condenses an optical beam on an information surface of an optical disc in which an information signal is recorded with a predetermined track gestalt.

An optical pickup which has an object lens transportation device which moves said object lens to an abbreviated perpendicular to a direction equivalent to said track.

Light spot reflected from said optical disc is divided into an abbreviated perpendicular to a direction equivalent to said track, Said light spot is divided into an end field and a middle area to the center, and said end field and said middle area are divided almost in parallel to a direction which is further equivalent to said track, and it is a photo detector which has two or more light-receiving cells which receive light comparatively therefore divided by these. By performing an operation according to an output of two or more of said light-receiving cells which receive light of said middle area, By performing an operation according to an output of two or more of said light-receiving cells which receive said track, a tracking-error detection means to detect a relative displacement of said optical beam, and light of said end field, By calculating a light spot displacement detecting means which detects a relative displacement of said light spot on said photo detector, an output of said tracking-error detection means, and an output of said light spot displacement detecting means, It is predetermined weighting about an alternating current component of an output of the 1st compensation means that outputs an amended tracking error signal, and an output of said light spot displacement detecting means, said tracking-error detection means or said 1st compensation means.

[Claim 6]An optical disk unit having the 2nd compensation means that outputs a light spot displacement detection signal amended by performing processing characterized by comprising the following, and subtracting or adding.

An object lens which condenses an optical beam on an information surface of an optical disc in which an information signal is recorded with a predetermined track gestalt.

An optical pickup which has an object lens transportation device which moves said object lens to an abbreviated perpendicular to a direction equivalent to said track.

Light spot reflected from said optical disc is divided into an abbreviated perpendicular to a direction equivalent to said track, Said light spot is divided into an end field and a middle area to the center, and said end field and said middle area are divided almost in parallel to a direction which is further equivalent to said track, and it is a photo detector which has two or more light-receiving cells which receive light comparatively therefore divided by these. By performing an operation according to an output of two or more of said light-receiving cells which receive light of said middle area, By performing an operation according to an output of two or more of said light-receiving cells which receive said track, a tracking-error detection means to detect a relative displacement of said optical beam, and light of said end field, and giving a predetermined high region operating characteristic, By calculating a light spot displacement detecting means which detects a relative displacement of said light spot on said photo detector, an output of said tracking-error detection means, and an output of said light spot displacement detecting means, A filter which has said high region operating characteristic and the almost same high region operating characteristic by considering an output of the 1st compensation means that outputs an amended tracking error signal, and said tracking-error detection means or said 1st compensation means as an input, About an output of said filter, and an output of said light spot displacement detecting means, it is predetermined weighting.

[Claim 7]An object lens which condenses an optical beam on an information surface of an optical disc in which an information signal is recorded with a predetermined track gestalt, An optical pickup which has an object lens transportation device which moves said object lens to an abbreviated perpendicular to a direction equivalent to said

track, Light spot reflected from said optical disc is divided into an abbreviated perpendicular to a direction equivalent to said track, said light spot to an end field and a middle area to the center, [divide and] Divide said end field and said middle area almost in parallel to a direction which is further equivalent to said track, and by these A photo detector which has two or more light-receiving cells which receive light comparatively therefore divided, By performing an operation according to an output of two or more of said light-receiving cells which receive light of said middle area, By performing an operation according to an output of two or more of said light-receiving cells which receive said track, a tracking-error detection means to detect a relative displacement of said optical beam, and light of said end field, The 1st compensation means that outputs a tracking error signal amended by calculating a light spot displacement detecting means which detects a relative displacement of said light spot on said photo detector, an output of said tracking-error detection means, and an output of said light spot displacement detecting means, A tracking control means which drives said object lens transportation device according to said amended tracking error signal, and constitutes a tracking control system, By calculating an output of an output of said light spot displacement detecting means, said tracking-error detection means, or said 1st compensation means, An optical disk unit performing said operation only when it has the 2nd compensation means that outputs an amended light spot displacement detection signal and said tracking control system is opening said 2nd compensation means. [Claim 8]An optical disk unit, wherein it has the 2nd compensation means that outputs a light spot displacement signal amended by performing processing characterized by comprising the following, and subtracting or adding and said 2nd compensation means changes the amount of weighting according to a kind and a field of said optical disc. An object lens which condenses an optical beam on an information surface of an optical disc in which an information signal is recorded with a predetermined track gestalt.

An optical pickup which has an object lens transportation device which moves said object lens to an abbreviated perpendicular to a direction equivalent to said track.

Light spot reflected from said optical disc is divided into an abbreviated perpendicular to a direction equivalent to said track, Said light spot is divided into an end field and a middle area to the center, and said end field and said middle area are divided almost in parallel to a direction which is further equivalent to said track, and it is a photo detector which has two or more light-receiving cells which receive light comparatively therefore divided by these. By performing an operation according to an output of two or more of said light-receiving cells which receive light of said middle area, By performing an operation according to an output of two or more of said light-receiving cells which receive said track, a tracking-error detection means to detect a relative displacement of said optical beam, and light of said end field, By calculating a light spot displacement detecting means which detects a relative displacement of said light spot on said photo detector, an output of said tracking-error detection means, and an output of said light spot displacement detecting means, It is predetermined weighting about an output of the 1st compensation means that outputs an amended tracking error signal, and an output of said light spot displacement detecting means, said tracking-error detection means or said 1st compensation means.

[Claim 9]By performing processing characterized by comprising the following, and subtracting or adding, An output of the 2nd compensation means that outputs an amended light spot displacement detection signal, and said 2nd compensation means is considered as an input, A slot crossing detection means to detect a slot crossing ingredient by said optical beam crossing said track, An optical disk unit, wherein it has a variable means into which the amount of weighting of said 2nd compensation means is changed according to an output of said slot crossing detection means, and said variable means changes said amount of weighting so that said slot crossing ingredient may decrease.

An object lens which condenses an optical beam on an information surface of an optical disc in which an information signal is recorded with a predetermined track gestalt.

An optical pickup which has an object lens transportation device which moves said object lens to an abbreviated perpendicular to a direction equivalent to said track.

Light spot reflected from said optical disc is divided into an abbreviated perpendicular to a direction equivalent to said track, Said light spot is divided into an end field and a middle area to the center, and said end field and said middle area are divided almost in parallel to a direction which is further equivalent to said track, and it is a photo detector which has two or more light-receiving cells which receive light comparatively therefore divided by these. By performing an operation according to an output of two or more of said light-receiving cells which receive light of said middle area, By performing an operation according to an output of two or more of said light-receiving cells which receive said track, a tracking-error detection means to detect a relative displacement of said optical beam, and light of said end field, By calculating a light spot displacement detecting means which detects a relative displacement of said light spot on said photo detector, an output of said tracking-error detection means, and an output of said light spot displacement detecting means, It is predetermined weighting about an output of the 1st compensation means that outputs an amended tracking error signal, and an output of said light spot displacement detecting means, said tracking-error detection means or said 1st compensation means.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention A compact disk (it abbreviates to CD hereafter), a mini disc. It is related with detection of the tracking error signal especially in an optical disk unit, and the detection means of an objective lens position about the optical disk unit which plays or records optical discs, such as (it abbreviates to MD hereafter), a magneto-optical disc, and a phase change disk.

[0002]

[Description of the Prior Art]As a tracking detection means of an optical disk drive, from the former to the far field method. The method called (it abbreviating to the FF method hereafter) or the push pull method (it abbreviates to the PP method hereafter) is known widely, and since composition is easy and the utilization efficiency of laser intensity is high compared with the 3 beam method, it is suitable for the recordable optical disk drive which needs a big laser output. However, when an object lens is displaced to a track and a perpendicular direction, a tracking error signal has a problem of producing offset, Even if a track position changes with the eccentricity of an optical disc, etc. at high speed, the traversal mechanism in which a high speed response is possible is required so that an object lens may always be located in a laser beam shaft center, and it had become a cause of the cost hike.

[0003]In recent years, the advanced FF method (or the PP method) for reducing offset of the tracking error signal at the time of object lens displacement is proposed (refer to Japanese Patent Application No. No. 28905 [eight to]).

[0004]The conventional optical disk unit which used the advanced FF method for tracking-error detection is explained below.

[0005]Drawing 11 is a block diagram showing the composition of the conventional optical disk unit which used the advanced FF method.

[0006]Although it is a motor for the turntable on which 1 fixes an optical disc and 2 fixes the optical disc 1, and 3 to rotate the optical disc 1 in drawing 11, and an object lens which 4 condenses an optical beam on the recording surface of the optical disc 1, and condenses catoptric light and being omitted on the drawing, It has an optical pickup including the object lens transportation device moved to an abbreviated perpendicular to the direction equivalent to the track of the optical disc 1. In order that 5 may make an optical beam follow the code track of the optical disc 1, The tracking actuator which displaces the object lens 4 to a track and a perpendicular direction, The light spot in which 6 condensed the catoptric light from the information surface of the optical disc 1 with the object lens 4, as opposed to the photo detector which comprises two or more light-receiving cells in which 7 receives the light spot 6, and the direction in which 8 is equivalent to a track in the photo detector 7 — abbreviated — the parting line vertically divided into two or more light-receiving cells and 9 are parting lines which divide the photo detector 7 into two or more light-receiving cells almost in parallel to the direction equivalent to a track. 7A, 7B, 7C, and 7D are the light-receiving cells divided by the parting line 8 and the parting line 9, the light-receiving cells 7A and 7B receive the light of an end field to the center of the light spot 6, and the light-receiving cells 7C and 7D receive the light of a middle area to the center of the light spot 6. 10 subtracts the output of the light-receiving cell 7D from the output of the light-receiving cell 7C (difference of a middle area), A tracking-error detection means to detect the relative displacement of the optical beam and code track which condensed on the disk recording surface, and to output a tracking error signal, and 11, The output of the light-receiving cell 7B is subtracted from the output of the light-receiving cell 7A (difference of an end field), The light spot displacement detecting means which detects the track of the light spot 6 on the photo detector 7, and a vertical relative displacement, and outputs a light spot displacement detection signal, The amplifying means (amplification factor =K1 time) to which 12 carries out weighting to the output signal of the light spot displacement detecting means 11, and 13 are compensation means which subtract the output of the amplifying means 12 from the output of the tracking-error detection means 10, and perform offset correction of a tracking error signal.

In relation to an embodiment of the invention, this is called 1st compensation means.

The tracking control means which 14 gives phase compensation, low-pass compensation, etc. to a tracking error signal, and constitutes a tracking control system, A light spot displacement control means for 15 to give phase compensation, low-pass compensation, etc. to a light spot displacement signal, and to constitute a light spot displacement control system, They are a selecting means which 16 chooses the output of the tracking control means 14, and the output of the light spot displacement control means 15, and is outputted, and a driving means which 17 considers the output of the selecting means 16 as an input, and drives the tracking actuator 5.

[0007]The conventional optical disk unit constituted as mentioned above is explained using drawing 12 about the operation below.

[0008]Drawing 12 is a mimetic diagram showing the situation of the light spot 6 on the photo detector 7 in drawing 11. In drawing 12, since the numerals 6-9, 7A-7D are the same as that of what was explained by drawing 11, explanation is omitted. Although the light spot 6 is the light spot (zero-order diffracted light) reflected without diffracting on the information surface of the optical disc 1, 6A and 6B are the light spot (primary [**] diffracted light) diffracted and reflected with the track form on the information surface of the optical disc 1. In the field from which the zero-order diffracted light 6 and the primary diffracted lights 6A and 6B lap, and interference is started, the slot crossing signal corresponding to an optical beam crossing a track is acquired.

[0009]Since the field where the zero-order diffracted light 6 and the primary diffracted lights 6A and 6B overlap is mainly a portion of the middle area (7C, 7D) of the photo detector 7 as it understands by drawing 12, By calculating the difference (7C-7D) of a middle area by the tracking-error detection means 10, what is called a push pull tracking error signal is acquired. However, since the light spot 6 is displaced to a track and a perpendicular direction (longitudinal direction of drawing 12) on the photo detector 7 when the object lens 4 is displaced to the track and perpendicular direction of the optical disc 1, the offset also corresponding to displacement of an object lens or the difference (7C-7D) of the middle area occurs.

[0010]Since there are few fields where the primary diffraction 6A and 6B, on the other hand, overlaps the zero-order diffracted light 6 in an end field (7A, 7B), By calculating the difference (7A-7B) of an end field by the light spot displacement detecting means 11, Without being influenced by the slot crossing ingredient (what is called a push pull tracking error signal) corresponding to an optical beam crossing a track The displacement on the photo detector 7 of the light spot 6, That is, it can output, the offset ingredient corresponding to displacement, i.e., the light spot displacement detection signal, of the object lens 4. By carrying out the multiplication of the suitable weighting coefficient K1 by the amplifying means 12 to the light spot displacement detection signal acquired here, and subtracting from the tracking error signal further acquired by the difference of the middle area by the compensation means 13 of offset, A means to amend offset by displacement of the object lens 4 is proposed from the former (Japanese Patent Application No. No. 194895 [nine to]).

[0011]Here, since displacement of the object lens 4 is detected by the light spot displacement detecting means 11, the objective lens position control system which controls the position of an object lens to a position can be constituted using this light spot displacement detection signal. That is, when reading an information signal from the optical disc 1, the output of the tracking control means 14 is chosen by the selecting means 16, and a tracking control loop is constituted. In order to change the read position of information, when performing access operation, the output of the light spot displacement control means 15 is chosen by the selecting means 16, an objective lens position control loop is constituted, and the whole optical pickup is transported to a track and a perpendicular direction (not shown). This does not depend on the influence of the gravity by applied acceleration or attitude difference when transporting an optical pickup, disturbance vibration, etc., but access operation can be performed, always controlling an object lens to a mechanical or optical center position.

[0012]

[Problem(s) to be Solved by the Invention]However, in the above-mentioned conventional composition, the slot crossing ingredient by an optical beam crossing a track to a light spot displacement detection signal mixed, this became the disturbance over an objective lens position control system, and it had SUBJECT that a control characteristic got worse.

[0013]This is explained using drawing 12, drawing 13, and drawing 14 below.

[0014]In drawing 12, the portion which carried out hatching is a portion which the field where the primary diffracted lights 6A and 6B overlap the light spot (zero-order diffracted light) 6 protruded into the end field (7A, 7B) of the photo detector 7.

[0015]Drawing 13 shows the signal wave form of each part when the object lens 4 is displaced to a track perpendicular direction, A horizontal axis shows the amount of displacement of the object lens 4, a vertical axis shows change of each signal, and a The output signal of the tracking-error detection means 10 (differential signal of a middle area), b is an output signal (differential signal of an end field) of the light spot displacement detecting means 11, and c is an output signal (amended tracking error signal) of the compensation means 13 of offset.

[0016]Drawing 14 is a wave form chart showing the situation of the output signal of the light spot displacement detecting means 11 when the object lens 4 is displaced to a track perpendicular direction, a horizontal axis shows the amount of displacement of the object lens 4, and the offset ingredient corresponding to displacement of the object lens in a and b are the mixing ingredients of slot crossing.

[0017]In drawing 12, although the end field (7A, 7B) of the photo detector 7 is a field which is not ideally influenced by the primary diffracted lights 6A and 6B, as actually shown in the hatching portion of drawing 12, the influence of the primary diffracted light leaks in many cases. It is because it is effective to narrow a middle area (7C, 7D) for an end field (7A, 7B) widely in order to heighten the offset correction effect of a tracking error signal when the object lens 4 shifts as for this.

[0018]This is explained using drawing 13. As shown in drawing 13, linearity when the object lens 4 shifts excels the differential signal b of the end field in the differential signal a of the middle area. The light spot 6 is an outline round shape, and since luminous energy distribution is not uniform, either (the center section of light volume of a circle is large), when the light spot 6 moves on the photo detector 7, it can understand it easily that the field where the direction of the difference signal of an end field maintains linearity is narrow. Therefore, in the field in which the

linearity of the difference signal b of an end field was lost, as for amended tracking error signal c, offset is not amended correctly. In order to extend the field where the linearity of the difference signal of an end field is secured in order to ease this phenomenon as much as possible, what the area of the end field on the photo detector 7 is physically extended for (that is, a middle area is narrowed) is effective. However, for this reason, as mentioned above, the primary diffracted light leaks to an end field, and the slot crossing mixing ingredient b by an optical beam crossing a track to a light spot displacement detection signal, as shown in drawing 14 as a result mixes. It became the disturbance to the objective lens position control system, and there was a problem of causing aggravation of a control characteristic.

[0019] This invention solves the above-mentioned conventional problem, and it aims at detecting an ideal light spot displacement detection signal without mixing of a slot crossing mixing ingredient.

[0020]

[Means for Solving the Problem] In order to attain this purpose, an optical disk unit of this invention has the 2nd compensation means that outputs an amended light spot displacement detection signal by calculating an output of an output of a light spot displacement detecting means, a tracking-error detection means, or the 1st compensation means.

[0021] It has the 2nd compensation means that outputs an amended light spot displacement detection signal by performing processing which includes an output of an output of a light spot displacement detecting means, a tracking-error detection means, or the 1st compensation means for predetermined weighting, and subtracting or adding.

[0022] It has the 2nd compensation means that outputs an amended light spot displacement detection signal by performing processing which contains predetermined weighting for an alternating current component of an output of a light spot displacement detecting means, and an output of a tracking-error detection means or the 1st compensation means, and subtracting or adding.

[0023] A filter which has the high region operating characteristic of a light spot displacement detecting means, and the almost same high region operating characteristic by considering an output of a tracking-error detection means or the 1st compensation means as an input. It has the 2nd compensation means that outputs an amended light spot displacement detection signal by performing processing which includes an output of a filter, and an output of a light spot displacement detecting means for predetermined weighting, and subtracting or adding.

[0024] By calculating an output of an output of a light spot displacement detecting means, a tracking-error detection means, or the 1st compensation means, It has the 2nd compensation means that outputs an amended light spot displacement detection signal, . [whether the 2nd compensation means calculates, only when a tracking control system is open, and] It has the 2nd compensation means that outputs an amended light spot displacement detection signal by performing processing which includes an output of an output of a light spot displacement detecting means, a tracking-error detection means, or the 1st compensation means for predetermined weighting, and subtracting or adding.

[0025]. [whether the 2nd compensation means changes the amount of weighting according to a kind and a field of an optical disc, and] By performing processing which includes an output of an output of a light spot displacement detecting means, a tracking-error detection means, or the 1st compensation means for predetermined weighting, and subtracting or adding, An output of the 2nd compensation means that outputs an amended light spot displacement detection signal, and the 2nd compensation means is considered as an input, It has a slot crossing detection means to detect a slot crossing ingredient by an optical beam crossing a track, and a variable means into which the amount of weighting of the 2nd compensation means is changed according to an output of a slot crossing detection means, and a variable means changes the amount of weighting so that a slot crossing mixing ingredient may decrease.

[0026] Even if the primary diffracted light leaks to an end field and a slot crossing mixing ingredient mixes this invention in a light spot displacement detection signal by the above-mentioned composition, By carrying out predetermined weighting to a signal including a differential signal of a middle area, and subtracting or adding to it, it has the operation that a mixed slot crossing mixing ingredient is cancellable.

[0027]

[Embodiment of the Invention] Hereafter, each embodiment of this invention is described using drawing 10 from drawing 1.

[0028] (Embodiment 1) Drawing 1 is a block diagram showing the composition of the optical disk unit in the embodiment of the invention 1.

[0029] In drawing 1, since the numerals 1-17, and 7A-7D are the same as that of drawing 11 of a conventional example, they omit explanation. The weighting means which carries out the multiplication of the predetermined weighting coefficient K2 to the tracking error signal with which offset by the lens shift to which the 1st compensation means 13 outputs 18 was amended, and 19 are subtraction means which subtract the output of the weighting means 18 from the output of the light spot displacement detecting means 11. This weighting means 18 and subtraction means 19 constitute the 2nd compensation means.

[0030] This embodiment constituted as mentioned above is described using drawing 2 below.

[0031] Drawing 2 is a signal waveform diagram of each part when an object lens is displaced to a track and a perpendicular direction in the optical disk unit of this Embodiment 1, A horizontal axis shows the amount of displacement of an object lens, and a The output of the light spot displacement detecting means 11 (the differential signal of an end field = 7A-7B), The output signal (amended light spot displacement detection signal) of the

subtraction means 19 whose b is an output signal (amended tracking error signal $= (7C-7D)-K1 \times (7A-7B)$) of the 1st compensation means 13 and whose c is the 2nd compensation means is shown.

[0032]As SUBJECT of the conventional example explained, in order that a slot crossing mixing ingredient may mix in the differential signal of an end field, the output signal of the light spot displacement detecting means 11 turns into a signal with which the ingredient corresponding to displacement of the object lens 4 was overlapped on the slot crossing mixing ingredient, as shown in a of drawing 2. On the other hand, since offset according [the amended tracking error signal] to displacement of the object lens 4 is canceled, as shown in b of drawing 2, the output of the tracking-error detection means 10 does not depend on displacement of the object lens 4, but serves as only a slot crossing mixing ingredient (what is called a push pull ingredient). Here, since both the slot crossing mixing ingredients of a and b of drawing 2 are produced when the zero-order diffracted light 6 and the primary diffracted lights 6A and 6B of drawing 12 overlap, it is the same signal fundamentally and amplitude differs mutually, but the phase is mostly in agreement. Therefore, the multiplication of the weighting coefficient K2 to which the amplitude of the mutual slot crossing ingredient after weighting becomes almost equal by the weighting means 18 which is the 2nd compensation means is carried out to the output of the 1st compensation means 13. By similarly subtracting from the output of the light spot displacement detecting means 11 by the subtraction means 19, as shown in c of drawing 2, the slot crossing mixing ingredient contained in the output of the light spot displacement detecting means 11 can be canceled, and only the ingredient corresponding to displacement of the object lens 4 can be outputted.

[0033]By this Embodiment 1, as mentioned above by subtracting by performing processing containing predetermined weighting by the weighting means 18 which is the 2nd compensation means about the output of the light spot displacement detecting means 11, and the output of the 1st compensation means 13, By outputting the amended light spot displacement detection signal, the ideal objective lens position signal which does not contain a slot crossing mixing ingredient is generable.

[0034](Embodiment 2) Drawing 3 is a block diagram showing the composition of the optical disk unit in the embodiment of the invention 2.

[0035]In drawing 3, since the numerals 1-19, and 7A-7D are the same as that of drawing 1 of Embodiment 1, they omit explanation. By considering the output of the 1st compensation means 13 as an input, 20 is a highpass filter (HPF) which restricts passage of a low-pass ingredient, and constitutes the 2nd compensation means with the weighting means 18 and the subtraction means 19.

[0036]This Embodiment 2 constituted as mentioned above is hereafter described using drawing 4.

[0037]Drawing 4 is a signal waveform diagram of each part when an object lens is displaced to a track and a perpendicular direction in the optical disk unit of Embodiment 2. A horizontal axis shows the amount of displacement of an object lens, and a The output of the light spot displacement detecting means 11 (the differential signal of an end field $= 7A-7B$), The output signal (amended light spot displacement detection signal) of the subtraction means 19 whose b is an output signal (amended tracking error signal $= (7C-7D)-K1 \times (7A-7B)$) of the 1st compensation means 13 and whose c is the 2nd compensation means is shown.

[0038]Since linearity when the object lens 4 shifts excels the differential signal of the end field in the differential signal of the middle area as SUBJECT of the conventional example explained using drawing 12, in the field in which the linearity of the difference signal of an end field was lost, as for the amended tracking error signal, offset is not amended correctly. Therefore, as shown in b of drawing 4, as for the amended tracking error signal which the 1st compensation means 13 outputs, the shift of an object lens may be unable to amend offset in a large portion above to some extent. If the multiplication of the weighting coefficient K2 is carried out by the weighting means 18 which is the 2nd compensation means and it similarly subtracts from the output of the light spot displacement detecting means 11 by the subtraction means 19 to such a signal, The original ingredient corresponding to displacement of the object lens will be made it not only to cancel a slot crossing mixing ingredient, but to produce distortion, as shown in c of drawing 4.

[0039]So, according to this Embodiment 2, by cutting the dc component of the amended tracking error signal with the highpass filter 20, the offset ingredient by displacement of an object lens can be cut, and distortion of the amended light spot displacement detection signal can be removed.

[0040]Here, in the frequency band passed with the highpass filter 20, although the distortion of the amended light spot displacement detection signal is unremovable, since a big problem is not produced without direct-current distortion, a practical effect is large [it is usually rare for distortion by a high region to pose a problem, and].

[0041]By this Embodiment 2, as mentioned above by subtracting by performing processing which contains predetermined weighting for the alternating current component of the output of the light spot displacement detecting means 11, and the output of the 1st compensation means 13, By having the 2nd compensation means that outputs the amended light spot displacement detection signal, Even when the correction errors of offset of the tracking error signal over the shift of an object lens remain, an ideal objective lens position signal without distortion can be generated excluding a slot crossing ingredient.

[0042](Embodiment 3) Drawing 5 is a block diagram showing the composition of the optical disk unit in the embodiment of the invention 3.

[0043]In drawing 5, since the numerals 1-19, and 7A-7D are the same as that of drawing 1 of Embodiment 1, they omit explanation. The band pass filter (BPF) which 21 considers the output of the 1st compensation means 13 as an input, and restricts passage of a low-pass ingredient and a high-frequency component, it is a low pass filter (LPF) which 22 considers the output of the light spot displacement detecting means 11 as an input, and restricts passage of a high-frequency component — the high region operating characteristic of the band pass filter 21 and the low

pass filter 22 — about — I am doing one.

[0044]This Embodiment 3 constituted as mentioned above is described using drawing 6 below.

[0045]Drawing 6 is a signal waveform diagram of each part in case an optical beam crosses a track. In drawing 6, a horizontal axis shows the relative displacement of an optical beam and a track, and a The output of the light spot displacement detecting means 11 (the differential signal of an end field = $7A-7B$), The output signal (amended light spot displacement detection signal) of the subtraction means 19 whose b is an output signal (amended tracking error signal = $(7C-7D)-K1 \times (7A-7B)$) of the 1st compensation means 13 and whose c is the 2nd compensation means is shown.

[0046]As Embodiment 1 explained, amplitude differs in the slot crossing mixing ingredient contained in the difference signal of an end field, and the slot crossing mixing ingredient contained in the amended tracking error signal mutually, but originally the phase is mostly in agreement. When the frequency of a slot crossing mixing ingredient is lower enough than the high pass zone of each circuit system, a problem does not have it, but. When phase lag occurs under the influence of the high region operating characteristic of a circuit system when the frequency of a slot crossing mixing ingredient is not lower than the high pass zone of one of circuit systems enough, and the high region operating characteristic of a mutual circuit system is not in agreement, as shown in a of drawing 6, and b, a gap is produced in a mutual phase. Since it does not disappear thoroughly even if it subtracts the signal with which the phase shifted, the slot crossing mixing ingredient which cannot be canceled as shown in c of drawing 6 remains in the amended light spot displacement detection signal after subtracting by the subtraction means 19.

[0047]By then, the thing for which the high region operating characteristic of the mutual circuit system subtracted by the subtraction means 19 is mostly coincided in this Embodiment 3 (the high region operating characteristic of the band pass filter 21 and the low pass filter 22 is coincided mostly). Since it does not depend on the frequency of a slot crossing ingredient but a mutual phase is always mostly in agreement, a slot crossing ingredient can always be canceled nearly thoroughly by subtraction.

[0048]although the high region operating characteristic of the low pass filter 22 may be changed according to various operational modes (it changes according to the zone of an objective lens position control system.) Usually, the above-mentioned effect can be acquired by [, such as changing according to the number of rotations and linear velocity of an optical disc under record reproduction which are accessing under record reproduction and are changed,] changing synchronously so that the high region operating characteristic of the band pass filter 21 may always be in agreement also in these cases.

[0049]The filter which has the high region operating characteristic of a light spot displacement detecting means, and the almost same high region operating characteristic by considering the output of the 1st compensation means as an input by this Embodiment 3 as mentioned above, By subtracting by performing processing which includes the output of a filter, and the output of a light spot displacement detecting means for predetermined weighting, By having the 2nd compensation means that outputs the amended light spot displacement detection signal, it does not depend on the frequency of a slot crossing ingredient, but the ideal objective lens position signal which always does not contain a slot crossing mixing ingredient can be generated.

[0050](Embodiment 4) Drawing 7 is a block diagram showing the composition of the optical disk unit in the embodiment of the invention 4.

[0051]In drawing 7, since the numerals 1-19, and 7A-7D are the same as that of drawing 1 of Embodiment 1 and 21 is the same as that of the band pass filter (BPF) shown in drawing 5 of Embodiment 3, explanation is omitted. 23 tracking control loop opening-and-closing instructions and 24, The traverse motor which transports the whole optical pickup to a track and a perpendicular direction in order to change the position which carries out record reproduction of the information signal, The driving means in which 25 drives the traverse motor 24, and 26, According to the tracking control loop opening-and-closing instructions 23, the switching means turned on and off and 27 whether the output of the light spot displacement control means 15 is connected to the driving means 25, It is a switching means which turns on and off whether the output of the weighting means 18 is connected to the subtraction means 19 according to the tracking control loop opening-and-closing instructions 23.

[0052]This Embodiment 4 constituted as mentioned above is described below.

[0053]First, when the tracking control loop opening-and-closing instructions 23 open a tracking control loop, The output of the light spot displacement control means 15 is chosen by the selecting means 16, it is impressed by the tracking actuator 5 via the driving means 17, and the lens position control system which controls the position of the object lens 4 to a position is constituted. Simultaneously, the switching means 27 is closed by the tracking control loop opening-and-closing instructions 23, the output of the weighting means 18 is connected to the subtraction means 19, and cancellation processing of a slot crossing mixing ingredient is performed. At this time, on-off of the tracking control loop opening-and-closing instructions 23 opening the switching means 26, and connecting the output of the light spot displacement control means 15 to the driving means 25 is carried out.

[0054]Next, when closing a tracking control loop by the tracking control loop opening-and-closing instructions 23, The output of the tracking control means 14 is chosen by the selecting means 16, it is impressed by the tracking actuator 5 via the driving means 17, and the tracking control system which controls an optical beam to the center position of a desired track is constituted. Simultaneously, the switching means 26 is closed by the tracking control loop opening-and-closing instructions 23, and the output of the light spot displacement control means 15 is connected to the driving means 25. This will drive the traverse motor 24 in the direction in which the absolute value of a light spot displacement detection signal decreases. Since the tracking control loop has closed even if a traverse motor is driven and it moves the whole optical pickup, the optical beam is followed on the predetermined track,

namely, the position of the object lens 4 is being fixed to the track. Therefore, by driving the traverse motor 24, displacement of the object lens within an optical pickup will change, and the whole optical pickup drives so that it may be located at the center always mechanical [an object lens] or optical as a result.

[0055]In this case, it is required for the tracking control loop to always have closed and for the optical beam to follow to a track. Otherwise, since an object lens will also move together if a traverse motor is driven and the whole optical pickup is moved, an object lens is uncontrollable at the mechanical or optical center.

[0056]When the tracking actuator 5 is generally constituted using a flat spring etc., the flexible region of an actuator will start prudence **** under the influence of the gravity by attitude difference, and displacement of an object lens will hang down in prudence as a result, but. By driving a traverse motor as mentioned above, it cannot be based on attitude difference but an object lens can always be controlled to a mechanical or optical center position.

[0057]However, since the thing to which the optical beam follows the track in this case and which in other words tracking control has started is a premise, only few levels in which the following error of tracking control is shown have generated the push pull ingredient. That is, since the mixing amounts of the slot crossing mixing ingredient to the light spot displacement detection signal which is a differential signal of an end field are also very few, even if it excludes cancellation processing of slot crossing, it is convenient practically. Therefore, the tracking control loop opening-and-closing instructions 23 open the switching means 27, and processing of the band pass filter 21 and the weighting means 18 is suspended simultaneously.

[0058]Since it is necessary to perform simultaneously processing of the compensating filter of the tracking control means 14, driving processing of a traverse motor, etc. in this case, there are many throughputs compared with the case where the tracking control loop is generally being opened. Since time sharing performs processing of these circuit systems using a processor etc. in many cases these days, if there are many throughputs, or it cannot end processing within predetermined time, in order to make it end within predetermined time, it is necessary to heighten the throughput of a processor, and problems, like cost becomes high arise. It is very useful practically to reduce the throughput within predetermined time by suspending processing of the band pass filter 21 or the weighting means 18 like this Embodiment 4, when the tracking control loop is closed.

[0059]By this Embodiment 4, as mentioned above by calculating the output of the light spot displacement detecting means 11, and the output of the 1st compensation means 13, Have the 2nd compensation means that outputs the amended light spot displacement detection signal, and the 2nd compensation means, By calculating, only when the tracking control system is open, the burden of circuit systems, such as a processor, can be eased and the ideal objective lens position signal which does not contain a slot crossing mixing ingredient can be generated.

[0060](Embodiment 5) Drawing 8 is a block diagram showing the composition of the optical disk unit in the embodiment of the invention 5.

[0061]In drawing 8, since the numerals 1-17, and 19, and 7A-7D are the same as that of drawing 1 of Embodiment 1 and 21 is the same as that of the band pass filter (BPF) shown in drawing 5 of Embodiment 3, explanation is omitted. 30 is a weighting means which carries out the multiplication of the weighting coefficient K2 by considering the output of the band pass filter 21 as an input, and constitutes the 2nd compensation means with the subtraction means 19. This weighting means 30 is constituted so that the coefficient K2 may be changed according to the kind 28 and the field 29 of an optical disc which are recorded or played.

[0062]This Embodiment 5 constituted as mentioned above is described using drawing 9 below.

[0063]In the latest optical disk unit, several different optical discs are recorded or played with one device in many cases. for example, -- common CD or a CD-ROM player -- CD and CD-R (CD -- rewritable). At a laser disc (it abbreviates to LD hereafter) player, MD-ROM disk, MD-RAM disk, etc. are mentioned with LD, CD, and a DVD player with a DVD-ROM disk, a DVD-RAM disk, CD, and CD-R and an MD player. It is necessary to record or play in these several optical discs in which physical shape (the depth, width, a track pitch, a continuous ditch, prepit, etc. of a track groove) differs in many cases. MD is explained as an example below.

[0064]Drawing 9 is a figure showing typically the physical shape of the track on the recording surface of the disk of MD. In drawing 9, the track form of MD-ROM disk and b a The track form of MD-RAM disk, c shows the track form of the pit section formed in the inner periphery of MD-RAM disk, The depth of the pit of MD-ROM disk and hb ha The groove of MD-RAM disk, or the depth of a land, When hc shows the depth of the pit of the pit section formed in the inner periphery of MD-RAM disk, sets wavelength of the laser beam to be used to λ and considers it as 780 nm of λ abbreviation, they are $h_a \cdot \lambda / 5$, and $h_b \cdot h_c \cdot \lambda / 8$.

[0065]As MD-ROM disk is shown in a of drawing 9, the unevenness 9a intermittently called a pit is formed on the recording surface, and as MD-RAM disk is shown in b of drawing 9, the continuous ditch 9b called a groove or a land is formed on the recording surface. As shown in c of drawing 9, the same pit as MD-ROM disk is formed in what is called a TOC area formed in the inner periphery of MD-RAM disk, but the depth of the pit differs from MD-ROM disk. Thus, an MD player or the recorder needs to record or play the disk (ROM/RAM) which is two kinds from which the physical shape of a track differs, and the shape of the track changes with fields also within the same disk in MD-RAM disk.

[0066]Thus, since the methods which the optical beam which condensed on the recording surface of an optical disc diffracts under the influence of a track differ when the physical shape of a track differs, The luminous energy distribution on the photo detector 7 of the zero-order diffracted light 6 of drawing 12 and the primary diffracted lights 6A and 6B differs, and the mixing amounts of the slot crossing mixing ingredient to an end field also differ. Therefore, since the optimum values of the weighting coefficient K2 for canceling mixing of a slot crossing mixing ingredient also differ, By changing the value of the coefficient K2 to three kinds for the pit sections of the object for

MD-ROM, the object for MD-RAM, and MD-RAM according to the kind and field of an optical disc in the weighting means 30, It can be considered as the optimal weighting coefficient according to each disk or field with easy composition, and a leak lump of a slot crossing ingredient can always be canceled correctly.

[0067]By this Embodiment 5, the amended light spot displacement detection signal is outputted as mentioned above by subtracting by performing processing which contains predetermined weighting as it is also with the weighting means 30 which is the 2nd compensation means about the output of the light spot displacement detecting means 11, and the output of the 1st compensation means 13. This 2nd compensation means is easy composition by changing the amount of weighting according to the kind 28 and the field 29 of an optical disc, It cannot depend on the kind or field of an optical disc, but a leak lump of a slot crossing ingredient can always be canceled correctly, and the ideal objective lens position signal which does not contain a slot crossing mixing ingredient can be generated.

[0068](Embodiment 6) Drawing 10 is a block diagram showing the composition of the optical disk unit in the embodiment of the invention 6.

[0069]In drawing 10, since the numerals 1-17, and 19, and 7A-7D are the same as that of drawing 1 of Embodiment 1 and 21 is the same as that of the band pass filter (BPF) shown in drawing 5 of Embodiment 3, explanation is omitted. An amount detection means of leakage lumps for 31 to consider the output of the subtraction means 19 as an input, and for the slot crossing mixing ingredient to a light spot displacement detection signal to leak, and to measure the amount of lumps, and 32, It is a weighting means to leak by considering the output of the band pass filter (BPF) 21 as an input, and to change the value of the weighting coefficient K2 according to the input of the amount measuring means 31 of lumps, and the 2nd compensation means consists of these band pass filters 21, the weighting means 32, and the subtraction means 19.

[0070]This Embodiment 6 constituted as mentioned above is described below.

[0071]As Embodiment 5 explained, the mixing amount of the slot crossing mixing ingredient to a light spot displacement detection signal (differential signal of an end field) changes with the physical shape of a track. Therefore, even when the kind and field of an optical disc are the same, when track form varies delicately at the time of mass production, the mixing amount of a slot crossing mixing ingredient varies delicately. Since the slot crossing mixing ingredient to an end field leaks and the amount of lumps changes delicately even if the luminous energy distribution of an optical beam changes, the mixing amount of a slot crossing mixing ingredient varies delicately with mass production dispersion etc. of the beam spread angle of the semiconductor laser used, for example for an optical pickup. Thus, the mixing amount of the slot crossing mixing ingredient to the light spot displacement detection signal detected with the differential signal of an end field, Since it varies delicately according to mass production dispersion of an optical pickup or an optical disc, it is desirable to adjust the coefficient K2 to the weighting means 32 on the optimal background for every optical pickup to be used or every optical disc which carries out record reproduction. By leaking, and changing the coefficient K2 of the weighting means 32 in this Embodiment 6, so that the slot crossing mixing ingredient mixed in the light spot displacement detection signal which the subtraction means 19 outputs may be detected and this may become the minimum by the amount detection means 31 of lumps, It does not depend on mass production dispersion of the optical pickup to be used or the optical disc which carries out record reproduction, but a leak lump of a slot crossing mixing ingredient can always be canceled correctly.

[0072]A means with various means to detect a slot crossing ingredient from the light spot displacement detection signal which the subtraction means 19 outputs is considered easily. For example, the mixing amount of a slot crossing mixing ingredient is detectable also by asking for the upper part envelope and bottom envelope of a light spot displacement detection signal respectively, and searching for those differences, where an objective lens position control system is opened. The same detection is possible also by integrating with this in quest of the absolute value of a light spot displacement detection signal, and it is correctly detectable if means, such as carrying out synchronous detection to the slot crossing mixing ingredient of the tracking error signal amended [which the 1st compensation means 13 outputs], are used.

[0073]By this Embodiment 6, as mentioned above by subtracting by performing processing which includes the output of a light spot displacement detecting means, and the output of the 1st compensation means for predetermined weighting, The output of the 2nd compensation means that outputs the amended light spot displacement signal, and the 2nd compensation means is considered as an input, A slot crossing detection means to detect the slot crossing mixing ingredient by an optical beam crossing a track, Have a variable means into which the amount of weighting of the 2nd compensation means is changed according to the output of a slot crossing detection means, and a variable means, By changing the amount of weighting so that a slot crossing mixing ingredient may decrease, It cannot depend on mass production dispersion of the optical pickup to be used or the optical disc which carries out record reproduction, but a leak lump of a slot crossing mixing ingredient can always be canceled correctly, and the ideal objective lens position signal which does not contain a slot crossing mixing ingredient can be generated.

[0074]Although the case where data processing was carried out by the subtraction means 19 which constitutes the 2nd compensation means was explained, it may be made to output the light spot change detecting signal amended by performing data processing in the adding means in each embodiment of this invention.

[0075]Although it had composition which cancels the slot crossing mixing ingredient of a light spot displacement detection signal using the tracking error signal which amended the offset by displacement of an object lens which the 1st compensation means 13 outputs, If it is a signal including the differential signal of a middle area, the signal (namely, output signal of the tracking-error detection means 10) which has not amended offset by displacement of

an object lens will be used, It is also possible to cancel the slot crossing mixing ingredient of a light spot displacement detection signal, and such composition is also included in the scope of right of this invention. However, since a light spot displacement detection signal is made to produce distortion so that he can understand easily from the contents which explained the case where amendment of offset by displacement of an object lens was imperfect at Embodiment 2, in this case, As quality of a light spot displacement detection signal, the direction of composition of that each embodiment showed is excellent.

[0076]It is not necessary to be necessarily a center position, and although the target position of the objective lens position control system was made into the mechanical or optical center position of an object lens, in each embodiment, it is also possible to make predetermined value gap **** into the target position of control from the center, and there is no change in the meaning of this invention also in that case.

[0077]In this Embodiment 4, only when the tracking control loop had closed, presupposed that cancellation processing of a slot crossing mixing ingredient is performed, but. When a means to distinguish whether tracking control has started is formed and tracking control has not started, it is good also as composition which performs cancellation processing of a slot crossing mixing ingredient.

[0078]In each embodiment, although the division means of the light spot 6 presupposed that the parting line 8 and the parting line 9 divide the photo detector 7, a hologram element or other means may divide the light spot 6.

[0079]Although the 1st and the 2nd parting line 8 and 9 were made [one] respectively and the photo detector 7 was divided into each six light-receiving cells 7A, 7A, 7B, 7B, 7C, and 7D in each embodiment, two or more the 1st and 2nd parting line may be books respectively, and the number of light-receiving cells is not restricted to six in that case.

[0080]The electric processing means in each embodiment may be analog circuitry, may carry out the A/D conversion of this, and may process it by a digital circuit or software.

[0081]In Embodiments 2-6, the highpass filter 20 and the band pass filter 21 may be formed in the latter part of the weighting means 18, 30, and 32, and there is no change in the meaning of this invention.

[0082]

[Effect of the Invention]As explained above, this invention has the 2nd compensation means that outputs the amended light spot displacement detection signal by subtracting by performing processing which includes the output of the output of a light spot displacement detecting means, a tracking-error detection means, or the 1st compensation means for predetermined weighting (or addition).

[0083]It has the 2nd compensation means that outputs the amended light spot displacement detection signal by subtracting by performing processing which contains predetermined weighting for the alternating current component of the output of a light spot displacement detecting means, and the output of a tracking-error detection means or the 1st compensation means (or addition).

[0084]The filter which has the high region operating characteristic of a light spot displacement detecting means, and the almost same high region operating characteristic by considering the output of a tracking-error detection means or the 1st compensation means as an input, It has the 2nd compensation means that outputs the amended light spot displacement detection signal by subtracting by performing processing which includes the output of a filter, and the output of a light spot displacement detecting means for predetermined weighting (or addition).

[0085]By calculating the output of the output of a light spot displacement detecting means, a tracking-error detection means, or the 1st compensation means, It has the 2nd compensation means that outputs the amended light spot displacement detection signal, . [whether the 2nd compensation means calculates, only when the tracking control system is open, and] It has the 2nd compensation means that outputs the amended light spot displacement detection signal by subtracting by performing processing which includes the output of the output of a light spot displacement detecting means, a tracking-error detection means, or a compensation means for predetermined weighting (or addition).

[0086]. [whether the 2nd compensation means changes the amount of weighting according to the kind and field of an optical disc, and] By subtracting by performing processing which includes the output of the output of a light spot displacement detecting means, a tracking-error detection means, or a compensation means for predetermined weighting (or addition), The output of the 2nd compensation means that outputs the amended light spot displacement detection signal, and the 2nd compensation means is considered as an input, It has a slot crossing detection means to detect the slot crossing mixing ingredient by an optical beam crossing a track, and a variable means into which the amount of weighting of the 2nd compensation means is changed according to the output of a slot crossing detection means.

[0087]A variable means by changing the amount of weighting so that a slot crossing mixing ingredient may decrease, Can generate the ideal objective lens position signal which does not contain a slot crossing mixing ingredient, and, Even when the correction errors of offset of the tracking error signal over the shift of an object lens remain, Can generate an ideal objective lens position signal without distortion, excluding a slot crossing mixing ingredient, and, Do not depend on the frequency of a slot crossing mixing ingredient, but can generate the ideal objective lens position signal which always does not contain a slot crossing mixing ingredient, and the burden of circuit systems, such as a processor, is eased, Can generate the ideal objective lens position signal which does not contain a slot crossing mixing ingredient, and with easy composition. Do not depend on the kind or field of an optical disc, but a leak lump of a slot crossing mixing ingredient is always canceled correctly, Can generate the ideal objective lens position signal which does not contain a slot crossing mixing ingredient, and, It does not depend on mass production dispersion of the optical pickup to be used or the optical disc which carries out record reproduction, but a leak lump of a slot

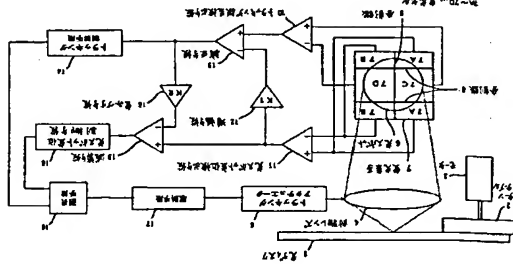
crossing mixing ingredient is always canceled correctly, and it has the effect that the ideal objective lens position signal which does not contain a slot crossing mixing ingredient is generable.

[Translation done.]

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(54) 【発明の名称】 光ディスク装置

(57) 【要約】 (修正有)
【課題】 光ディスクを再生記録する光ディスク装置に
関し、トラッキング誤差信号の検出及び対物レンズ位置
の検出手段。
【解決手段】 光ディスク 1 からの反射光スポット 6 を
トラック相当の方向に対し略垂直に分割し、光スポット
6 をその中心に対して端領域と中領域とに分割し、該端
域をさらにトラックの相当方向に対し略平行に分割した
光の複数受光セル 7 A ~ 7 D の出力に応じた演算を行
い、トラックと光ビームのトラッキング誤差検出手段 1
0 と、端領域の光の複数の受光セルの出力に応じた演算
を行い、受光素子上の光スポットの相対変位の光スポッ
ト変位検出手段 1 1 とを有する。トラッキング誤差検出
手段 1 0 の出力と光スポット変位検出手段 1 1 の出力の
重みづけした和を第 1 の補正手段 1 3 から補正さ
れたトラッキング誤差信号を第 2 の補正手段である重み
づけ手段 1 8 で所定の重みづけを含む処理を行い、理想
的なレンズ変位検出信号を得る。



- (2) 特開平11-339285
- 面に分割して、前記光スポットをその中心に対して端領域と中領域とに分割し、かつ、前記端領域及び前記中領域をさらに前記トラックに相当する方向に対して略平行に分割し、これら分割によって分割された光を受光する複数の受光素子を有する受光素子と、前記中領域の光を受光する複数の前記受光セルの出力に応じた演算を行うことにより、前記トラックと前記光ビームの相対変位を検出するトラッキング誤差検出手段と、前記端領域の光を受光する複数の前記受光セルの出力に応じた演算を行うことにより、前記受光素子上の前記光スポットの相対変位を検出する光スポット変位検出手段と、前記トラッキング誤差検出手段の出力と前記光スポット変位検出手段の出力の重みづけした和を第 1 の補正手段である重みづけ手段 18 で所定の重みづけを含む処理を行い、理想的なレンズ変位検出信号を得る。

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【請求項 4】 所定のトラック形態で情報信号が記録されている光ディスクの情報面上に光ビームを集光する対物レンズと、前記対物レンズを前記トラックに相当する方向に対して略垂直に移動させる対物レンズ移動手段を有する光ビックアップと、前記光ディスクから反射した光スポットを前記トラックに相当する方向に対して略垂直に分割して、前記光スポットをその中心に対して端領域と中領域とに分割し、かつ、前記端領域及び前記中領域をさらに前記トラックに相当する方向に対して略平行に分割し、これら分割によって分割された光を受光する複数の受光素子を有する受光素子と、前記中領域の光を受光する複数の前記受光セルの出力に応じた演算を行うことにより、前記トラックと前記光ビームの相対変位を検出するトラッキング誤差検出手段と、前記端領域の光を受光する複数の前記受光セルの出力に応じた演算を行うことにより、前記受光素子上の前記光スポットの相対変位を検出する光スポット変位検出手段と、前記トラッキング誤差検出手段の出力と前記光スポット変位検出手段の出力の重みづけした和を第 2 の補正手段である重みづけ手段 18 で所定の重みづけを含む処理を行い、理想的なレンズ変位検出信号を得る。

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【請求項 5】 所定のトラック形態で情報信号が記録されている光ディスクの情報面上に光ビームを集光する対物レンズと、前記対物レンズを前記トラックに相当する方向に対して略垂直に移動させる対物レンズ移動手段を有する光ビックアップと、前記光ディスクから反射した光スポットを前記トラックに相当する方向に対して略垂直に分割して、前記光スポットをその中心に対して端領域と中領域とに分割し、かつ、前記端領域及び前記中領域をさらに前記トラックに相当する方向に対して略平行に分割し、これら分割によって分割された光を受光する複数の受光素子を有する受光素子と、前記中領域の光を受光する複数の前記受光セルの出力に応じた演算を行うことにより、前記トラックと前記光ビームの相対変位を検出するトラッキング誤差検出手段と、前記端領域の光を受光する複数の前記受光セルの出力に応じた演算を行うことにより、前記受光素子上の前記光スポットの相対変位を検出する光スポット変位検出手段と、前記トラッキング誤差検出手段の出力と前記光スポット変位検出手段の出力の重みづけした和を第 2 の補正手段である重みづけ手段 18 で所定の重みづけを含む処理を行い、理想的なレンズ変位検出信号を得る。

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【請求項 6】 所定のトラック形態で情報信号が記録されている光ディスクの情報面上に光ビームを集光する対物レンズと、前記対物レンズを前記トラックに相当する方向に対して略垂直に移動させる対物レンズ移動手段を有する光ビックアップと、前記光ディスクから反射した光スポットを前記トラックに相当する方向に対して略垂直に分割して、前記光スポットをその中心に対して端領域と中領域とに分割し、かつ、前記端領域及び前記中領域をさらに前記トラックに相当する方向に対して略平行に分割し、これら分割によって分割された光を受光する複数の受光素子を有する受光素子と、前記中領域の光を受光する複数の前記受光セルの出力に応じた演算を行うことにより、前記トラックと前記光ビームの相対変位を検出するトラッキング誤差検出手段と、前記端領域の光を受光する複数の前記受光セルの出力に応じた演算を行うことにより、前記受光素子上の前記光スポットの相対変位を検出する光スポット変位検出手段と、前記トラッキング誤差検出手段の出力と前記光スポット変位検出手段の出力の重みづけした和を第 2 の補正手段である重みづけ手段 18 で所定の重みづけを含む処理を行い、理想的なレンズ変位検出信号を得る。

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【請求項 7】 所定のトラック形態で情報信号が記録されている光ディスクの情報面上に光ビームを集光する対物レンズと、前記対物レンズを前記トラックに相当する方向に対して略垂直に移動させる対物レンズ移動手段を有する光ビックアップと、前記光ディスクから反射した光スポットを前記トラックに相当する方向に対して略垂直に分割して、前記光スポットをその中心に対して端領域と中領域とに分割し、かつ、前記端領域及び前記中領域をさらに前記トラックに相当する方向に対して略平行に分割し、これら分割によって分割された光を受光する複数の受光素子を有する受光素子と、前記中領域の光を受光する複数の前記受光セルの出力に応じた演算を行うことにより、前記トラックと前記光ビームの相対変位を検出するトラッキング誤差検出手段と、前記端領域の光を受光する複数の前記受光セルの出力に応じた演算を行うことにより、前記受光素子上の前記光スポットの相対変位を検出する光スポット変位検出手段と、前記トラッキング誤差検出手段の出力と前記光スポット変位検出手段の出力の重みづけした和を第 2 の補正手段である重みづけ手段 18 で所定の重みづけを含む処理を行い、理想的なレンズ変位検出信号を得る。

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【請求項 8】 所定のトラック形態で情報信号が記録されている光ディスクの情報面上に光ビームを集光する対物レンズと、前記対物レンズを前記トラックに相当する方向に対して略垂直に移動させる対物レンズ移動手段を有する光ビックアップと、前記光ディスクから反射した光スポットを前記トラックに相当する方向に対して略垂直に分割して、前記光スポットをその中心に対して端領域と中領域とに分割し、かつ、前記端領域及び前記中領域をさらに前記トラックに相当する方向に対して略平行に分割し、これら分割によって分割された光を受光する複数の受光素子を有する受光素子と、前記中領域の光を受光する複数の前記受光セルの出力に応じた演算を行うことにより、前記トラックと前記光ビームの相対変位を検出するトラッキング誤差検出手段と、前記端領域の光を受光する複数の前記受光セルの出力に応じた演算を行うことにより、前記受光素子上の前記光スポットの相対変位を検出する光スポット変位検出手段と、前記トラッキング誤差検出手段の出力と前記光スポット変位検出手段の出力の重みづけした和を第 2 の補正手段である重みづけ手段 18 で所定の重みづけを含む処理を行い、理想的なレンズ変位検出信号を得る。

成分が重畳された信号となる。一方、補正されたトラッキング誤差信号は、対物レンズ4の変位によるオフセットがキャンセルされているので、トラッキング誤差検出手段10の出力は、図2のbに示すように、対物レンズ4の変位に依らず溝クロス混入成分（いわゆるブッシュ成分）のみとなる。ここで、図2のaとbの溝クロス混入成分は、共に図12のaとbの溝クロス成分6A、6Bが重なり合うことにより生じたものであるから、基本的に同一様な信号であり、互いに幅幅は異なるが、位相はほぼ一致している。したがって、第1の補正手段13の出力に対して、第2の補正手段である重みづけ手段18によって重みづけ修正の互いの溝クロス成分の幅幅がほぼ等しくなるような重みづけ係数K2を乗算して、同じく減算手段19によって光スポット変位検出手段11の出力から減算することにより、図2のcに示すように、光スポット変位検出手段11の出力に含まれる溝クロス混入成分をキャンセルし、対物レンズ4の変位に対応した成分のみを出力することができる。

【0033】以上のように本実施の形態1では、光スポット変位検出手段11の出力と、第1の補正手段13の出力を、第2の補正手段である重みづけ手段18にて所定の重みづけを含む処理を行って減算することにより、補正された光スポット変位検出信号を出力することにより、潜たクロス混入成分を含まない理想的な対物レンズ位置信号を生成することができる。

【0034】(実施の形態2) 図3は本発明の実施の形態2における光ディスク装置の構成を示すブロック図である。

【0035】図3において、符号1～19及び7A～7Dは実施の形態1の図1と同様であるので説明を省略する。20は、第1の補正手段13の出力を入力として、低域成分の通過を制限するハイパスフィルタ（HPF）であり、重み付け手段18及び減算手段19と共に第2の補正手段を構成する。

【0036】以上のように構成された本実施の形態2について、以下、図4を用いて説明する。

【0037】図4は実態の形態2の光ディスク装置において、対物レンズがトラッキング駆動方向に変位した場合、各部の信号光波形図であり、横軸は対物レンズの変位量を示し、光スポット変位位置手段11の出力（領域の差分信号＝ $7A-7B$ ）、bは第1の補正手段13の出力信号（補正されたトラッキング誤差信号＝ $(7C-7D)-K1 \times (7A-7B)$ ）、cは第2の補正手段4である減算手段19の出力信号（補正された光スポット変位量）を示している。

【0038】従来例の課題で図12を用いて説明したように、対物レンズ4がシフトした場合の直線性は、端領域の差分信号より中領域の差分信号の方が優れているため、補正されたトラッキング誤差信号は、端領域の差分信号の直線性が失われた領域ではオフセットが正しく補正

されない。そのため、第1の補正手段13が出力する開正されたトラッキング誤差信号は、図4のbに示すように、対物レンズのシフトが異なる程度であり、図4のaに示すように、対物レンズが補正されない場合である。このような場合に対して、第2の補正手段である重みづけ手段18で重みづけ係数K2を乗算し、同じく減算手段19で光スポット変位検出手段11の出力から減算すると、溝クロス入成分をキャンセルするのみならず、図4のcに示すように、対物レンズの変位に対応した本来の成分に歪みを生じさせてしまう。

【0039】そこで本実施の形態2では、ハイパスフィルタ20によって、補正されたトラッキング調整信号の直交成分をカットすることにより、対物レンズの変位によるオフセツト成分をカットし、補正された光スポット変位検出信号の歪みを除去することができる。

【0040】ここで、ハイパスフィルタ20で通過させた周波数帯域においては、補正された光スポット変位検出信号の歪みは除去できないが、通常は、高域での歪みが問題となることは少なく、直線的な歪みがなければ大きな問題は生じないため、実用上の効果は大きい。

【0041】以上のように本装置の形態2では、光素子2変位出力手段11の出力と、第1の補正手段13の出力の交流成分を、所定の重みづけを含む処理を行って減算することにより、補正された光素子2変位出力信号を出力する第2の補正手段を有することにより、対物レンズのシフトに対するトラッキング誤差信号のオフセットの補正誤差が残留している場合でも、階クロス成分を含まなく、かつ重みのない理想的な対物レンズ位置信号を生成できることである。

30 【0042】(実施の形態3)図5は本発明の実施の形態3における光ディスク装置の構成を示すブロック図である。

【0043】図5において、符号1～19及び7A～7Eは、実施形態1の図4と同様であるので説明を省略する。21は第1の補正手段13の出力を入力として低減成分と高減成分の通過を制御するバンドパスフィルタ(BPF)、22は光スポット変位検出手段11の出力を入力として高減成分の通過を制限するローパスフィルタ(LPF)であり、バンドパスフィルタ21とローパスフィルタ22の高減減特性はほぼ一致している。

【0044】以上のように構成された本実施の形態3について、以下図6を用いて説明する。

【0045】図6は光ビームがトラックを横断する場合の一組の信号波形図である。図6において、aは光スロット変位部とトラック11の出力（端領域の差分信号） $\text{信号} = 7A - 7B$ 、bは第1の補正手段13の出力信号（補正されたトラック11の出力（端領域の差分信号） $\text{信号} = 7A - 7B$ ）、cは第2の補正手段である減算手段19の出力信号（補正された光スロット変位部後出信号）を示す。

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【0046】実施の形態1で説明したように、領域域の差信号に含まれる溝クロス成分と、補正されたトラッキング信号の差信号に含まれる溝クロス成分は、互いに反相するが、本来その位相はほぼ一致している。溝クロス成分の周波数が、各々の回路系の高域域通過帯域より充てに低い場合は問題はないが、溝クロス成分の周波数がどちらかの回路系の高域域通過帯域より充てに高い場合は、回路系の高域域通過帯域より充てに低い場合と、回路系の高域域通過帯域より充てに高い場合とで、位相が逆転して互いに互いの位相にずれを生じる。位相がずれた信号を減算すると完全には消えない。減算手段19で減算した後の補正された差信号に含まれる溝クロス成分は減算後の信号に示すようにキャンセルされない溝クロス成分が現れる。

【0047】そこで本実施形態3では、減算手段19で減算する互いの回路系の増幅断特性をほぼ一致させて減算する互いの回路系の増幅断特性をほぼ一致させる（バンドパスフィルタ21とローパスフィルタ22の両増幅断特性をほぼ一致させる）ことにより、溝クロス成分の周波数に依らず、互いの位相成分が常にほぼ一致する。また、減算により常に溝クロス成分をほぼ完全にキャンセルすることができる。

【0048】ローパスフィルタ222の高域減衰特性は、様々な動作モードに応じて切り替える場合があるが（対称レズミ型共振器の帯域に応じた切り替え、通常、励起再生中とアーク発生中での切り替え、励起再生中の光ディレイの回転数や線速度に応じて切り替える等）、この場合にも、バンドパスフィルタ21の高域減衰特性が常に一致するように調整して切り替えることにより、上記の効果を得ることができる。

【0049】以上のように本実施形態3では、第1補正手段の出力を1入力として光素子2変位像出力手段の高域遮断特性とほぼ同様に高域遮断特性を持つフィルタ2を、所定の重みづけを含む処理を行って域増することにより、補正手段を光素子2変位像出力手段より第2の補正手段を有する光素子2変位像出力手段の出力と、フィルタの出力と光素子2変位像出力手段の出力を、第2の補正手段を有する光素子2変位像出力手段の出力に依らず、常に隣コラシタ成分を含むより理想的な対物レンズ位置信号を生成することができ、

【0050】（実施の形態4）図7は本発明の実施の形態4における光ディスク装置の構成を示すブロック図である。

【0051】図7において、符号1〜19及び7A〜7Dは本発明の示すパルス波形であり、21は実働の形に切り換えた状態を示している。22はラッチアップ抑制回路であるのを説明する省略する。23はラッチアップ抑制回路であるのを説明する省略する。24は、情報量を記録再生する位置をアーク開閉指令、24は、情報量を記録再生する位置を変更するために、光ピックアップ全体をトラックと垂直方向に移送するトラバースモータ、25はトラバースモータ24が移動する駆動手段、26は、トラックング制御

御報酬手帳開閉指令 23 に応じて、光スポット変位制御印射手段 15 の出力を駆動手段 5 に接続するか否かをオンオフする切り替え手段、27 は、トラッキング制御印閉報酬手帳開閉指令 23 に応じて、重みづけ手段 18 の出力を減算手段 19 に接続するか否かをオンオフする切り替え手段である。

【0052】以上のように構成された本実施の形態 4 について以下説明する。

【0053】まず、トラッキング制御ループを開閉指令23によりトラッキング制御ループを開く場合は、選択手

手段 16 で光スポット変位制御手段 15 の出力を選択し、駆動手段 17 を介して 4 位置を所定の位置に制御するレンズ位置制御系を構成する。同時に、トラック制御グループ開閉指令 23 により切り替え手段 27 を閉じて、重みづけ手段 18 の出力を減算手段 19 に接続して、演算回路 20 に成分のキャンセル処理を行う。またこのときは、トラック制御グループ開閉指令 23 により切り替え手段 26 を開いて、光スポット変位制御手段 15 の出力を駆動手段 25 に接続することを検知して、

【0054】次に、トラッキング制御ルーブル間図指令2-3においてトラッキング制御ルーブルを閉じる場合は、選択手段16でトラッキング制御手段14の出力を選択し、駆動手段17を介してトラッキングアクチュエータ5に印加し、光ビームを所望のトラッキングの中心位置に制御するトラッキング制御系を構成する。同時に、トラッキング制御ルーブル間図指令2-3により切り替え手段26を閉じて、スラット変位制御手段15の出力を駆動手段25に接続する。これにより、スラット変位検出信号の絶対値が減少する方向にトラバースモータ2を駆動す

ことになる。トラバースモータを駆動して光ビックアップ全体を移動させても、トラック制御グループが閉じているので、光ビームは所定のトラックに追従しており、即ち対物レンズの位置はトラックに対して固定されている。したがって、トラバースモータ24を駆動することにより、光ビックアップ内での対物レンズの変位が変化することになり、結果的に、対物レンズが常に機械的減衰は光学的な中心に位置するように光ビックアップ全体が駆動される。

【0055】この場合、必ずトラッキング制御ループが閉じていて、光ビームがトラックに対して追従していることが必要である。そうであれば、トラバースモータを駆動して光ビックアップ全体を移動すると、対物レンズも一緒に移動してしまうので、対物レンズを線性的に動かすことはできない。

【0056】一般に坂々などを用いてトラッキングアクチュエータ5を構成すると、姿勢差による重力の影響として対物レンズの歪みが生じ重たれを起し、結果として対物レンズの歪みが自重たれになることになり、上記のようにトラバースモータを駆動することにより、

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【0077】また本実施の形態4において、トラッキング制御ルーチが閉じている場合にのみ潜クロス混入成分のキャンセル処理を行うとしたが、トラッキング制御がかけられているかどうかを判別する手段を設けて、トラッキング制御がかけられていない場合に潜クロス混入成分のキャンセル処理を行う構成としても良い。

【0078】また各実施の形態において、光スポット6の分割手段は分割線8及び分割線9により受光素子7を分割するとして、光スポット6をプログラム素子等の手段によって分割しても良い。

【0079】また各実施の形態では、第1と第2の分割線8、9を各々1本ずつとして受光素子7を6つの受光素子7A、7B、7C、7Dに分割した。第1と第2の分割線は各々複数本であっても良く、その場合、受光素子の数は6つに限るものではない。

【0080】また各実施の形態における電気的処理手段は、アナログ回路であっても良いしこれをA/D変換してディジタル回路あるいはソフトウェアで処理するものであっても良い。

【0081】また、実施の形態2～6において、ハイパスフィルタ20やバンドパスフィルタ21は、重みづけ手段18、30、32の後段に設けても良く、本発明の趣旨に何ら変わりはない。

【0082】**【発明の効果】**以上説明したように本発明は、光スポット変位検出手段の出力とトラッキング誤差検出手段の出力は第1の補正手段の出力を、所定の重みづけを含む処理を行って減算（或いは加算）することにより、補正された光スポット変位検出手段の出力を有する。

【0083】また、光スポット変位検出手段の出力と、トラッキング誤差検出手段の出力は第1の補正手段の出力の交流成分を、所定の重みづけを含む処理を行って減算（或いは加算）することにより、補正された光スポット変位検出手段の出力を有する。

【0084】また、トラッキング誤差検出手段の出力は第1の補正手段の出力を、所定の重みづけを含む処理を行って減算（或いは加算）することにより、補正された光スポット変位検出手段の出力を有する。

【0085】また、光スポット変位検出手段の出力とトラッキング誤差検出手段の出力は第1の補正手段の出力の演算を行うことにより、補正された光スポット変位検出手段の出力を有し、第2の補正手段はトラッキング制御系が閉じている場合にのみ減算を行なうか、光スポット変位検出手段の出力とトラッキング誤差検出手段の出力は第2の補正手段の出力を、所定の重みづけを含む処理を行って減算（或いは加算）することにより、

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補正された光スポット変位検出手段の出力を有する。

【0086】第2の補正手段は、光ディスクの種類や領域に応じて重みづけ値を切り替えるか、光スポット変位検出手段の出力とトラッキング誤差検出手段の出力は補正手段の出力を、所定の重みづけを含む処理を行って減算（或いは加算）することにより、補正された光スポット変位検出手段の出力を有する。

【0087】可変手段は、潜クロス混入成分が低減するよう重みづけ値を可変することにより、潜クロス混入成分を含まない理想的な対物レンズ位置信号を生成することができるし、対物レンズのシフトに対するトラッキング誤差信号のオフセットの補正誤差が残留している場合でも、潜クロス混入成分を含まなく、かつ、至りの理想的な対物レンズ位置信号を生成することができる。

【0088】また、実施の形態2～6において、ハイパスフィルタ20やバンドパスフィルタ21は、重みづけ手段18、30、32の後段に設けても良く、本発明の趣旨に何ら変わりはない。

【0089】また、光スポット変位検出手段の出力と、トラッキング誤差検出手段の出力は第1の補正手段の出力の交流成分を、所定の重みづけを含む処理を行って減算（或いは加算）することにより、補正された光スポット変位検出手段の出力を有する。

【0090】また、光スポット変位検出手段の出力とトラッキング誤差検出手段の出力は第2の補正手段の出力を、所定の重みづけを含む処理を行って減算（或いは加算）することにより、

【0091】また、光スポット変位検出手段の出力とトラッキング誤差検出手段の出力は第2の補正手段の出力を、所定の重みづけを含む処理を行って減算（或いは加算）することにより、

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【図11】従来の光ディスク装置の構成を示すブロック図

【図12】図11における受光素子上の光スポットの様子を示す模式図

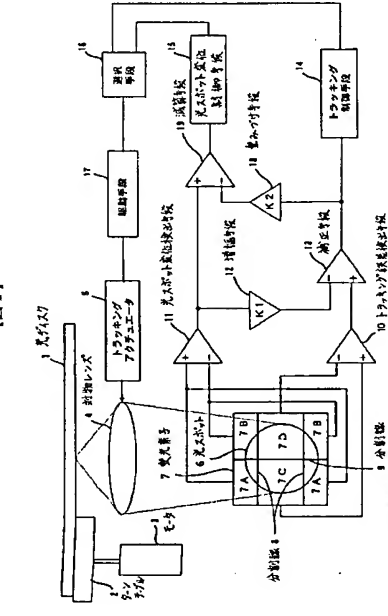
【図13】図11で対物レンズがトラッキング垂直方向に位置した場合の各部の信号波形図

【図14】図11で対物レンズがトラッキング垂直方向に位置した場合の光スポット変位検出手段の出力信号波形図

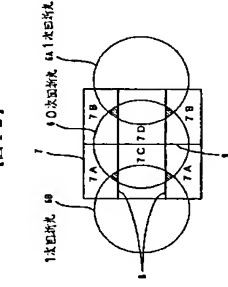
【符号の説明】

- 1 光ディスク
- 2 クラウドデータ
- 3 モータ
- 4 対物レンズ
- 5 トラッキングアクチュエータ
- 6 光スポット
- 7 受光素子
- 7A、7B 光スポットの端領域を受光する受光素子
- 7C、7D 光スポットの中領域を受光する受光素子

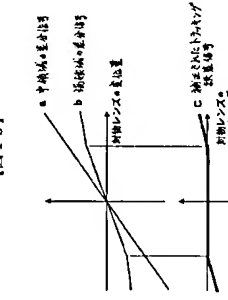
【図1】



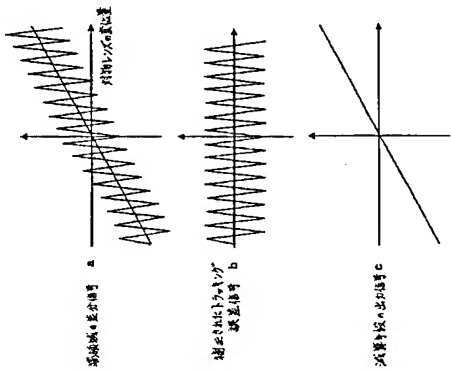
【図12】



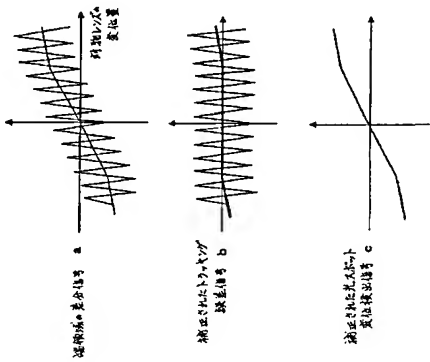
【図13】



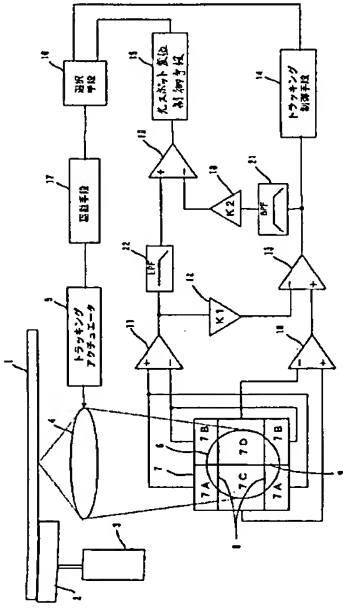
【図2】



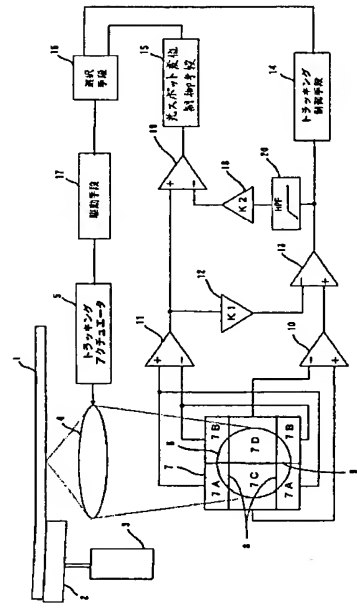
【図4】



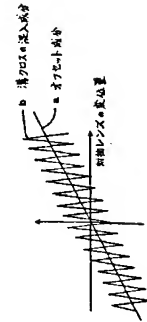
【図5】



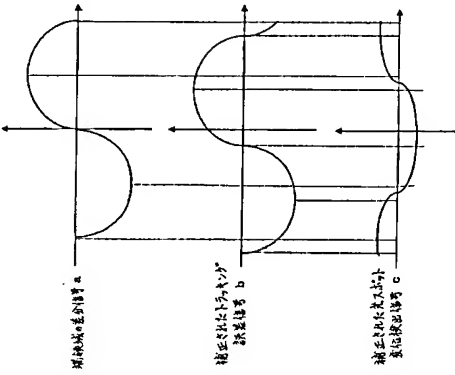
【図3】



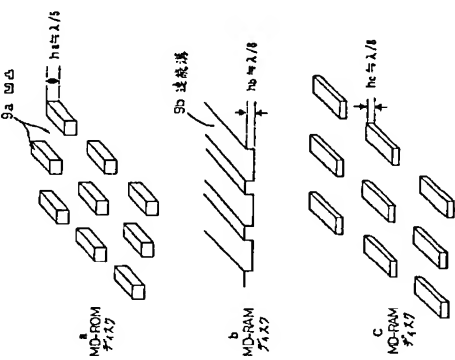
【図14】



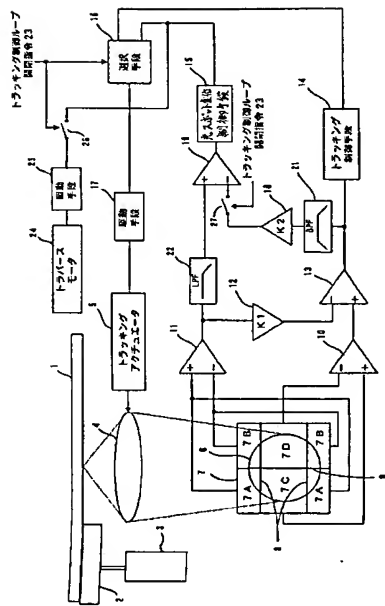
【図6】



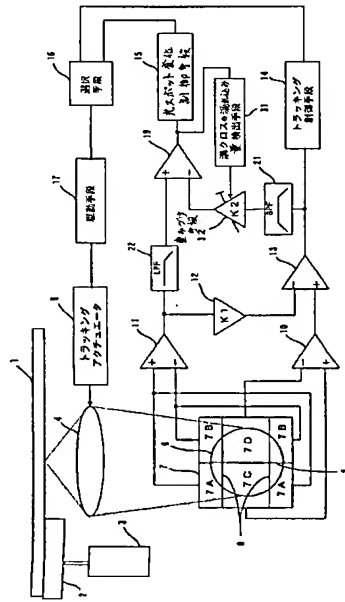
【図9】



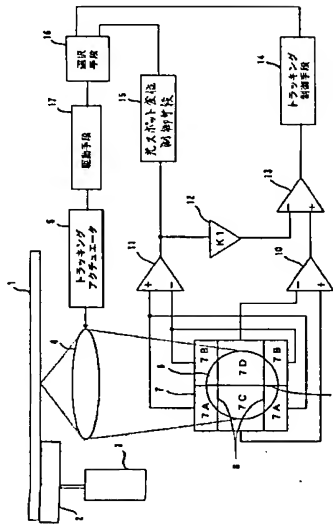
【図7】



【10】



【111】



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